



Phoebe Wang '17, in a photo uploaded to Facebook in March 2012.

MIT libraries planning major space renovations

Large project will include Hayden redesign

By Daniela Ganelin

The MIT administration said it is in the early stages of planning major renovations of campus libraries, including Hayden (humanities and sciences), Barker (engineering), and Rotch (architecture and planning). Organizers have not yet decided specific details of the project, and are encouraging input from the community.

The multi-year, multi-million-dollar renovations will likely include reorganizations of Hayden and Barker libraries and structural changes to Rotch, according to Jeffrey Ravel, Chair of the Faculty Committee on the Library System, and Steven Gass, interim director of libraries. The project aims to make library spaces more useful for students and staff, and to improve the

buildings' infrastructure.

According to Ravel and Gass, the centerpiece of the changes will be a redesign of Hayden Library. Spaces for both individual and group study, as well as classrooms, will be modified and expanded to better fit students' and instructors' needs. In order to facilitate interdisciplinary research, the engineering resources collection and the Geographic Information Systems laboratory in Building 7 might be moved to join the science resources already in Hayden. A cafe might be also added to "make this library more of a destination space," said Ravel.

Meanwhile, smaller-scale changes are planned for other library areas.

Barker Library will likely be emptied of

Barnhart announces period of reflection after death of Wang

'All doors open' response effort planned for Monday

By Tushar Kamath
NEWS EDITOR

President L. Rafael Reif announced Tuesday the death of Phoebe Wang '17, who local media reported was found dead in her MacGregor dorm room. In response to her death, as well as the deaths of several other members of the MIT community in recent months,

Chancellor Cynthia A. Barnhart PhD '88 and student leaders will call on the community to spend 15 minutes this coming Monday at noon to reflect on the effects of the recent deaths.

Wang was involved in a number of groups on campus; Reif's email to MIT said she was an active member of her dormitory as well as a flutist in the MIT Symphony Orchestra

(MITSO). Adam K. Boyles, the director of MITSO, wrote, in an email to *The Tech*, Phoebe "was well liked and respected by our whole MITSO family. We are honored to have had her art with us, albeit too briefly."

According to Barnhart, Wang's death triggered "an outpouring of responses from students, staff, fac-

Phoebe Wang, Page 10



MELISSA RENÉE SCHUMACHER—THE TECH

Libraries, Page 11

Hayden Library will soon undergo renovations.

'Shellshock' bug a massive vulnerability for BASH users

Bug leaves many Mac OSX, Linux users vulnerable

By Nicole Perlroth
THE NEW YORK TIMES

Long before the commercial success of the Internet, Brian J. Fox invented one of its most widely used tools.

In 1987, Fox, then a young programmer, wrote BASH, short for Bourne-Again Shell, a free piece of software that is now built into more than 70 percent of the machines that connect to the Internet. That includes servers, computers, routers, some mobile phones and even everyday items like refrigerators and cameras.

On Thursday, security experts warned that BASH contained a particularly alarming software bug that could be used to take control of hundreds of millions of machines, potentially including Macintosh computers and smartphones that use the Android operating system.

The bug, named Shellshock, drew comparisons to the Heartbleed bug that was discovered in a crucial piece of software last spring.

But Shellshock could be a bigger threat. While Heartbleed could be used to do things like steal passwords from a server, Shellshock can be used to take over the entire machine. And Heartbleed went unnoticed for two years and affected an esti-

mated 500,000 machines, but Shellshock was not discovered for 22 years.

That a flawed piece of code could go unnoticed for more than two decades could be surprising to many. But not to programmers.

Many of the commercial tools individual users and large corporations depend upon are built on top of programs that are written and maintained by a few unpaid volunteers in what is called the open-source community. That community, along with big companies like Google, adjusts and builds new things on top of older work. The Macintosh operating system, for example, is routinely updated, but it is built on top of older programs like Unix.

Sometimes there are flaws in that code. And over the years, the flaw becomes part of all sorts of products.

Fox maintained BASH — which serves as a sort of software interpreter for different commands from a user — for five years before handing over the reins to Chet Ramey, a 49-year-old programmer who, for the past 22 years, has maintained the software as an unpaid hobby. That is, when he is not working at his day job as a senior technology architect at Case Western Reserve University

Shellshock, Page 11

Changes to sorority recruitment increase retention

The MIT Panhellenic Association (Panhel) announced that five of MIT's six sororities issued a total of 189 bids during this year's formal recruitment, the same number of bids as reported by *The Tech* last year.

"We... implemented a couple structural changes that I believe were quite beneficial to our recruitment process," Panhel President Yasmin C. Inam '15 said.

One of those changes included reducing sorority recruitment to three days instead of the traditional four, which led to a 7 percent increase in retention without decreasing the number of bids.

Panhel also worked with MIT's orientation office to begin the newly-streamlined process one day early without interfering with freshman orientation.

This year's formal recruitment process was followed up by an informal recruitment kickoff, which begins the ongoing process of sororities attracting new members throughout the year. Alpha Epsilon Phi, which does not participate in formal recruitment, relies entirely on informal recruitment to attract new members.

Encouraged by this year's changes, Panhel looks "forward to continuing to grow and strengthen[ing] the Panhellenic community, and mak[ing] recruitment a valuable and enjoyable experience for interested women," Inan said.

—Navil Perez

IN SHORT

Add date is next Friday, October 4. Don't forget to officially add your classes by the end of that day. It is also the last day to change a subject to P/D/F or Sophomore Exploratory.

Wednesday is the final deadline for IAP externship applications. Check out <https://alum.mit.edu/students/NetworkwithAlumni/ExternshipProgram> for more information. All current students (including grad students) are eligible to apply.

The community picnic to honor ombusperson Mary Rowe is this Tuesday on Killian Court. All members of the MIT community are welcome to attend and celebrate her career at the Institute.

The UA Fall Festival is next Saturday, October 5. Featuring Kumail Nanjiani and Thomas Middleditch from HBO's *Silicon Valley*. Doors open at 7 p.m. Tickers are on sale at tickets.mit.edu.

The MIT Press Loading Dock sale is next weekend, October 4 and 5. Come take advantage of huge discounts on print literature both days from 10 a.m. to 6 p.m. in at the bookstore in Kendall square.

Send news information and tips to news@tech.mit.edu.

STEREOTYPICAL ACTION

Your regular dose of explosions and courtesy of Denzel Washington.

ARTS, p. 6

WHAT DOES THIS WORD MEAN?

The GRE hopes that you've brushed up on your vocab. **FUN, p. 7**

IN AN ALTERNATE UNIVERSE

Not even technology will lead you to your degree. **FUN, p. 7**



DRIFTING LIKE A FISH DURING THE DAY

Are you actually nocturnal, or just looking for a reason to procrastinate? **FUN, p. 7**

WOMEN'S TENNIS KEEPS PERFECT RECORD

Engineers win 5-4 against Babson.

SPORTS, p. 12

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Compiled by MIT
Meteorology Staff
and *The Tech*

Palestinian factions agree to resolve differences, leaders say

By Jodi Rudoren
THE NEW YORK TIMES

JERUSALEM — Leaders of rival Palestinian factions said Thursday that they had agreed to resolve their differences and allow the Palestinian Authority to return to the Gaza Strip so reconstruction could begin there next month.

Palestinian and Egyptian state news media outlets reported that the leaders of Hamas, the Islamist movement that dominates Gaza, and Fatah, the secular faction of the Palestinian president, Mahmoud Abbas, had made progress on the sticking points of their 5-month-old reconciliation pact, including the payment of duplicative government workers, security forces in Gaza and control of its crossing points. But they offered no specifics on any of these issues, and two officials from the Palestine Liberation Organization said Thursday’s statements lacked substance.

“These rhetorics I have heard so many times,” said one leader who is close to Abbas, speaking on the condition of anonymity to discuss the negotiations openly. “They reiter-

ated once again the same agreement that they had in the past, with all the problems in that agreement. So I don’t think there is a direct solution to the issue of the employees or the security or whatever.”

The announcement in Cairo came a day before Abbas is scheduled to make his annual address to the U.N. General Assembly, where he plans to appeal for a new international approach to ending Israel’s occupation of the West Bank and Gaza. It followed Egyptian-brokered talks this week both among the feuding Palestinian factions and with Israel regarding terms for a durable truce after this summer’s bloody seven-week battle between Israel and Gaza-based militant groups led by Hamas.

This month, the United Nations announced that it had reached an agreement with the Palestinian Authority and with Israel to facilitate the reconstruction of thousands of homes and other buildings destroyed across Gaza, though officials said details of how and when had not yet been determined.

Israel, which considers Hamas a

terrorist organization and does not have direct dealings with it, has insisted that the Palestinian Authority must re-establish a presence inside Gaza before it will allow for any expansion of the crossings it controls to provide for the transfer of construction materials. Egypt, the United States and other Western powers have also pushed for increased Palestinian Authority presence in Gaza throughout the discussions of a cease-fire.

Mousa Abu Marzook, a Hamas political leader, said at a news conference in Cairo on Thursday that the sides had agreed to have the Palestinian reconciliation government sworn in June 2 oversee Gaza’s crossings. Wafa, the official Palestinian news agency, quoted Marzook and Azzam al-Ahmad, the Fatah leader who has been coordinating talks with Hamas, both saying the new Palestinian government would soon take control of ministries in Gaza, and that a new committee would be formed to deal with the issues of employees, security, elections and reconvening the dormant Palestinian Parliament.

Ferguson Police Chief offers apology to Brown’s family

By Julie Bosman
THE NEW YORK TIMES

CHICAGO — The police chief of Ferguson, Missouri, issued a rare public apology Thursday for the death of Michael Brown, addressing the Brown family directly in a short video posted online.

“I want to say this to the Brown family. No one who has not experienced the loss of a child can understand what you’re feeling,” the police chief, Thomas Jackson, said, wearing a polo shirt and standing in front of an American flag.

“I am truly sorry for the loss of your son. I’m also sorry that it took so long to remove Michael from the street,” Jackson said. “The time that

it took involved very important work on the part of investigators who were trying to collect evidence and gain a true picture of what happened that day. But it was just too long, and I’m truly sorry for that.”

Brown, 18, was shot to death Aug. 9 by Darren Wilson, a police officer, and his body was left in the street for about four hours, stirring outrage in the community. Wilson has not been charged with a crime.

“I’m also aware of the pain and the feeling of mistrust felt in some of the African-American community toward the police department,” Jackson said. “The city belongs to all of us, and we’re all part of this community. It is clear that we have much work to do. As a community, a city and a na-

tion, we have real problems to solve.”

Since Brown’s death, Ferguson has been roiled by protests and anger over the circumstances of the killing. A grand jury has been meeting since late August to decide whether to indict Wilson. A decision is expected as soon as late October.

A lawyer for the Brown family, Anthony Gray, said in a text message that the apology “comes at a time when the trust and confidence in the chief has reached an irreversible low.”

“It is nearly impossible to measure any reach of his apology at this time,” Gray wrote. “Most observers, I believe, are locked into their opinions about the handling of the shooting of this unarmed teen.”

DHL to begin deliveries by drone in Germany

LONDON — In the world of drones, Europe is out to show that whatever the United States can do, it can do better.

That’s the plan for Friday, when a small pilotless aircraft, or drone, owned by the German logistics company DHL is expected to take off and ferry medicine to Juist, a sparsely populated island off the northwestern coast of Germany. The flight — expected to take as long as 30 minutes, depending on weather conditions — would be the first time a drone without the aid of even a land-based pilot has been authorized for regular use in Europe, the company said.

Like Amazon, which is running tests in Canada, and Google, which is conducting tests in Australia, DHL is hoping its month-long trial will prove that the technology — dubbed parcelcopter — can replace some of the traditional ways of delivering parcels to remote locations. Yet while Google and Amazon have outlined plans to potentially roll out their drone services across large areas, DHL said that it probably would not expand the trial across its global delivery network. Instead, the German logistics company said the drone technology could be used in special situations — in remote locations, for example — where it is more cost-effective to use an unmanned aircraft than to send a delivery van or a bike messenger.

—Mark Scott, The New York Times

Chrysler recalls 349,000 vehicles for faulty ignition switch

Chrysler announced Thursday that it would recall 349,442 vehicles worldwide for faulty ignition switches that could cause cars to suddenly turn off while driving, adding to the recent wave of automobile recalls related to ignition problems.

The latest recall affects 2008 vehicles, including the Jeep Commander and Grand Cherokee SUVs, earlier models of which were recalled in July for the same problem. The company is also recalling 2008 models of the Chrysler 300 sedan, the Dodge Charger sedan and the Dodge Magnum station wagon.

The problems are similar to the ignition defects identified in more than 16 million General Motors cars this year and in more than 1 million other Chrysler vehicles. The ignition switches in the latest group of recalled Chrysler models can rotate to the “accessory” or “off” position when jostled by a knee or bump in the road. Such a rotation can turn off power to the engine, disengage power steering and disable safety features like air bags.

Chrysler, a division of Fiat Chrysler Automobiles, said in a statement that it knew of one accident related to the defect, and that it had linked no deaths or injuries to it.

—Rebecca R. Ruiz, The New York Times

Death toll in Xinjiang violence may be higher than reported

BEIJING — Violent clashes last weekend in Xinjiang, the western Chinese region, killed and injured a higher number of people than state media had reported, witnesses and Western news media have indicated in recent days.

Citing local officials and residents, Radio Free Asia, which is funded by the U.S. government, said Thursday that more than a dozen people were killed — including three police officers — and around 100 wounded in the violence, which took place Sunday in three towns in the southern county of Bugur, known as Luntai in Chinese.

On Monday, the Xinjiang government’s Tianshan website said two people had been killed and referred to the incidents as “explosions.”

—Dan Levin, The New York Times



Wanna make columns?
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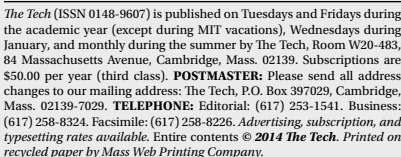
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idealist.org/gradfairs
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In the Tuesday, Sept. 23 issue of *The Tech* on page seven, the center spread titled “2014 Fall Career Fair” had no attribution. The photographs on this spread were taken by Megan Prakash ’18.

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Sleepy Sudoku

Solution, page 11

	9		1	3	8	6		
		3				5		
7		2					1	
		6	5		3			7
	7			4			6	
2			7		6	8		
	4					2		6
		7				1		
		8	2	6	9		5	

Instructions: Fill in the grid so that each column, row, and 3 by 3 grid contains exactly one of each of the digits 1 through 9.

Stressed Sudoku

Solution, page 11

4			5	6		3		
	6			3		2	5	
				9		8	6	
	5				3			
	3		4		8		1	
			2				3	
	4	1		8				
	2	6		4			7	
		5		2	9			6

Instructions: Fill in the grid so that each column, row, and 3 by 3 grid contains exactly one of each of the digits 1 through 9.

Tired Techdoku

Solution, page 11

40×		12+			4
	1		240×		11+
18×					
16+				18+	
	24×		7+		2
5		3			1

Instructions: Fill in the grid so that each column and row contains exactly one of each of the numbers 1–6. Follow the mathematical operations for each box.

Tense Techdoku

Solution, page 11

14+		30×			4
	12×			1–	
60×		2×	180×		
	4		12×		3
6×		4		180×	
10×					

Instructions: Fill in the grid so that each column and row contains exactly one of each of the numbers 1–6. Follow the mathematical operations for each box.

In The Pond

by Gail Grabowski

Solution, page 11

ACROSS

- 1 Baseball hats
5 Aerosol, for example
10 Numerical fact, for short
14 Army division
15 What something costs
16 Voice-mail signal
17 Mexican money
18 Lariats
19 Hotel-room fee
20 Graceful plunges into pools
22 Make broader
23 Devoured
24 Makes illegal
25 Posh residence
28 End-to-end measurements
31 Makeup for cheeks
32 Needle tip
34 Lubricate
35 Very uncommon
36 Used a vegetable peeler
37 Clinton’s vice president
38 CPR specialist
39 Ram of the zodiac

- 40 Free-for-all
41 Watered down
43 Social elite
44 Jealous feeling
45 Popeye and Bart Simpson
47 Paths to tollbooths
49 Stoop below, as a theater rope
53 Region
54 Person’s strong point
55 Money in Italy
56 Soft-soled shoes, for short
57 Toward the center
58 Have a go __ (try)
59 Jab with a finger
60 Birds’ homes
61 Some bakery loaves

DOWN

- 1 Small coffee containers
2 All over again
3 Leaning Tower city
4 Caveman’s era
5 Pixie
6 Show to be true

- 7 Turn red, as tomatoes
8 Top poker cards
9 “Absolutely!”
10 Yo-yo part
11 Inedible mushrooms
12 Start a poker pot
13 Kid older than 12
21 Partner at a prom
22 Would like to have
24 Flex
25 Made a mistake
26 “Me, too!”
27 Snug-collared sweater
28 Isn’t truthful
29 New staffer
30 Icy precipitation
32 Settled a bill
33 Mined rock
36 Hunter’s quarry
37 Closes in on
39 Off-road rides, for short
40 List with soups and salads
42 Anxious feeling
43 Wild cards in poker
45 Goes right or left

1	2	3	4		5	6	7	8	9		10	11	12	13
14					15						16			
17					18						19			
20					21					22				
				23					24					
25	26	27						28					29	30
31						32	33				34			
35					36					37				
38				39						40				
41			42						43					
		44					45	46						
47	48					49					50	51	52	
53					54					55				
56					57					58				
59					60					61				

- 46 Eight-piece band
47 Night-table light
48 Cowboy’s ending for buck
49 Fully cooked
50 Required task
51 One of the Great Lakes
52 Goes bad
54 Shark appendage



A good old-fashioned action movie

Washington and Csokas star in *The Equalizer*

COURTESY OF SONY PICTURES ENTERTAINMENT

The film's mellow beginning stereotypically highlights McCall's character as an average citizen, following him through his daily life at the HomeMart, his house, and the local diner. The gorgeous cinematog-

Marton Csokas plays Teddy, the boss of the Russian gang, masterfully. Teddy radiates an insistent hunger for power over his fellow gangsters and the helpless women in his control. With a distinctive Cockney British accent and a tailored suit, Csokas' smooth-talking character exudes the sliminess of a sociopathic villain. Csokas gives a delightful performance, but his character is remarkably one-sided, with little to distinguish him from any other thriller movie bad guy.

With the exception of a few important names here and there, the movie itself is also simple enough that it could easily be followed without words. Straightforward and predictable, the plot is far from original, but it still built a few moments of intense suspense during the film. Nevertheless, stereotypical action movie elements are stereotypical for a reason: they engage the audience. Even though *The Equalizer* may have included just a few explosions too many, the two hours I spent watching weren't wasted — Washington skillfully

Now Playing

doling out revenge is reason enough to see the film.

Q.E.D.

BY ERIKA TRENT

COMMON GRE VOCAB*

* TAKEN FROM ACTUAL STUDY GUIDES

"To praise"	"To criticize"	High in morals	Lack-ing morals		
- accolade	- berate	- execrate	- scrupulous	- artifice	- overweeni
- laud	- castigate	- lambaste	- probity	- charlatan	- perfidy
	- censure	- upbraid		- depravity	- prevaricat
	- excoriate	- vituperate		- glib	- supercilious
				- ignoble	- turpitude
				- ignominious	- venality

TIP: IF YOU SEE AN UNFAMILIAR WORD ON THE GRE, IT PROBABLY MEANS SOMETHING BAD.

WWW.QEDCOMICS.COM

Somewhere on the Search for Meaning... by Letitia Li

In an Alternate Universe...

I don't know how to find my way through grad school...

Don't worry! I have this magical relic called a GPS!

Location "Precipice of PhD" not found.
Did you mean:

Mountains of Misspent Time

Lagoon of Losing Data

Wellspring of Wishing for Results

Tower of Tormented Souls

Chasm of Checking E-mail

Bayou of Being Scooped

Dungeons of Disappointing Your Advisor

Valley of Verifying Results

Foothills of Failing Qualls

Trail of Troubleshooting Software

UPPERCUT by Steve Sullivan

PROF. SULLIVAN 14-101

SO IF IM ACTIVE DURING THE NIGHT, BUT DON'T GET ANY SLEEP IN THE DAY EITHER, AM I STILL NOCTURNAL, LIKE A BAT?

NAH, I THINK THAT MAKES YOU MORE LIKE A FISH.

YOU SWIM AROUND AT NIGHT, AND SLEEPILY RIDE THE CURRENT FROM CLASS TO CLASS MAKING WEIRD FACES DURING THE DAY.

IT'S JUST, ALL MY WORK GETS DONE LATE AT NIGHT. MAYBE I FOCUS BETTER WHEN I'M TIRED.

STEVE SULLIVAN SEPT. 2014

MAYBE YOU FOCUS BETTER WHEN IT'S THE LAST POSSIBLE SECOND TO DO WORK AND NO ONE IS AWAKE TO PLAY SUPER SMASH BROS. WITH YOU.

SHIT! HOLD UP. IS TODAY TUESDAY? CAN I BORROW A PEN FROM YOU REAL QUICK?

PHD

PILED HIGHER AND DEEPER

CECILIA, I KNOW YOU THINK YOUR RESEARCH IS INSIGNIFICANT...

BUT THE VALUE OF RESEARCH IS NEVER IMMEDIATELY APPARENT.

WHO KNOWS, MAYBE IN 20 YEARS SOMEONE WILL THINK WHAT YOU'VE DONE IS ACTUALLY USEFUL.

IS THAT SUPPOSED TO BE ENCOURAGING?

IN 20 YEARS, YES.

JORGE CHAM © 2014

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Solution, page 11

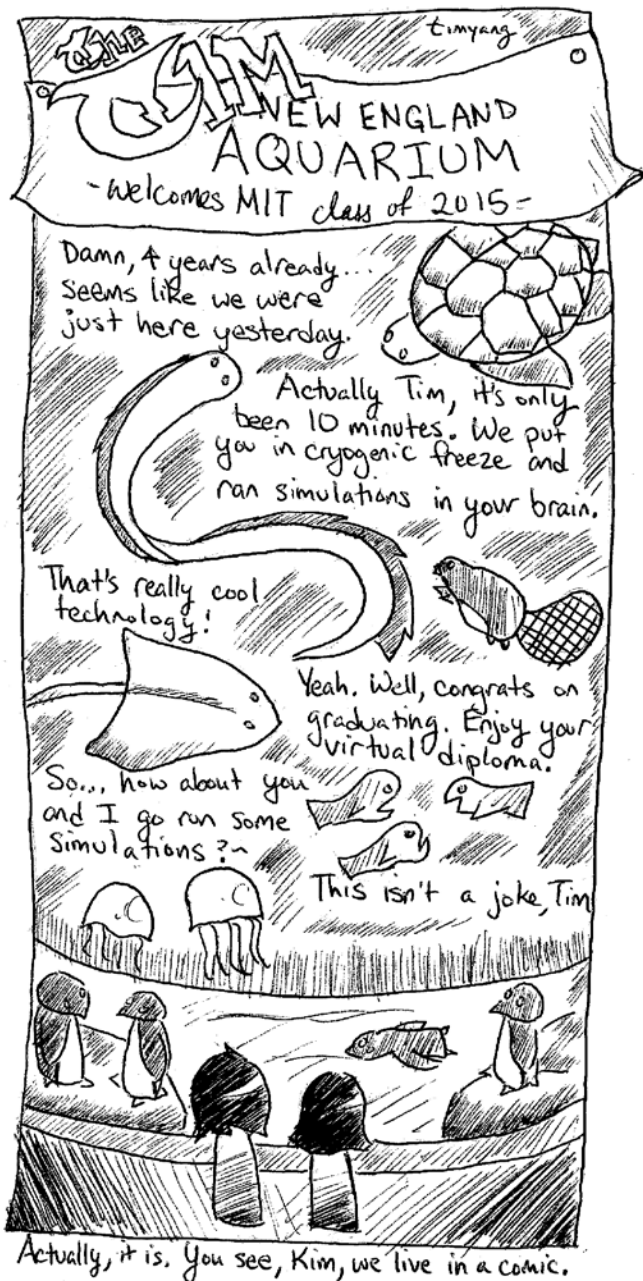
			9		5		7	8
5		3				4	9	2
			6	3		9		
3		9	7		8	5		1
		8		1	9			
7	9	1				6		3
8	4		3		6			

Instructions: Fill in the grid so that each column, row, and 3 by 3 grid contains exactly one of each of the digits 1 through 9.

Solution, page 11

6x		90x		8x	
120x				5	
	7+		24x		2
36x	2x		20x		6
		24x		15x	
	5		2x		3

Instructions: Fill in the grid so that each column and row contains exactly one of each of the numbers 1–6. Follow the mathematical operations for each box.



Solution, page 11

6x		24x		60x		35x
	28x		4-			
5		3x		210x		1-
84x			2		4-	
26+		1-	140x			4
					14+	
	16+					

Instructions: Fill in the grid so that each column and row contains exactly one of each of the numbers 1–7. Follow the mathematical operations for each box.



Criticism of BICEP's findings hold weight, reigniting conversations

By Dennis Overbye
THE NEW YORK TIMES

Stardust got in their eyes.

In the spring a group of astronomers who go by the name of BICEP announced they had detected ripples in the sky, gravitational waves that were the opening notes of the Big Bang. The finding was heralded as potentially the greatest discovery of the admittedly young century, but some outside astronomers said the group had underestimated the extent to which interstellar dust could have contaminated the results - a possibility that the group conceded in its official report in June.

Now a long-awaited report by astronomers using data from the European Space Agency's Planck satellite has confirmed that criticism, concluding that there was enough dust in BICEP's view of the sky to produce the swirly patterns without recourse to primordial gravitational waves.

"We show that even in the faintest dust-emitting regions there are no 'clean' windows in the sky," the authors, led by Jean-Loup Puget of the Astrophysical Institute in Paris, wrote in a paper submitted to the journal *Astronomy & Astrophysics* and posted online Monday.

As a result, cosmologists like the BICEP crew cannot ignore dust in their calculations. “However,” said Jonathan Aumont, another of the Planck authors, also from the Paris institute, “our work does not imply that they did not measure at all a cosmological signal. Moreover, due to the very different observation techniques and signal processing in the BICEP2 and Planck experiments, we cannot say how much of the signal they measured is due to dust” and how much to gravitational waves.

So this is not the end of the story, both the Planck scientists and the BICEP group agree. But the original euphoria that the secrets of inflation and quantum gravity might be at hand has evaporated. Planck and BICEP are now collab-

orating on a detailed comparison of their results.

John M. Kovac of the Harvard-Smithsonian Center for Astrophysics, lead author of the BICEP paper, said the new report confirmed in greater detail the trend suggested by the first Planck papers in the spring, which indicated there is more dust even in the cleanest parts of the galaxy than anyone had thought.

Raphael Flauger of the Institute for Advanced Study in Princeton, N.J., who first raised the issue of dust in the BICEP report, said it confirmed what he had thought. "It doesn't leave a lot of wiggle room," he wrote in an email, "and it seems clear that at least the majority of the signal is caused by dust."

The gravitational waves may exist, although they would be weaker than the BICEP analysis indicated, causing theorists to reshuffle their ideas. As Richard Bond, an early-universe expert at the University of Toronto and a Planck team member, put it: “Planck showed that dust could possibly be the entire BICEP2 signal, but Planck alone cannot decide. We have to do this in combination with BICEP2.”

The joint comparison and Planck's own polarization maps are due at the end of the year. If true, BICEP's detection of gravitational waves would confirm a theory that the universe began with a violent outward anti-gravitational swoosh known as inflation, the mainspring of Big Bang theorizing for the last three decades.

The disagreement over the BICEP finding will not mean the end of inflation theory; it just means it will be harder for cosmologists to find out how it worked. The BICEP group and an alphabet soup of competitors are soldiering on with new telescopes and experiments aimed at peeling away the secrets of the sky.

Michael S. Turner, a cosmologist at the University of Chicago, said: "This is going to be a long march, but the goal of probing the earliest moments of the universe makes it well worth the effort."

Dust is the bane of the existence of astrophysicists - and cosmologists. It is everywhere, and yet our understanding of it is very poor."

Others are less optimistic. Paul J. Steinhardt of Princeton University, a critic of the BICEP paper - and of inflation theory - said in an email that the BICEP paper should be retracted, "and we should return to good scientific practice."

The BICEP observations are the deepest look yet into a thin haze of microwaves, known as the cosmic background radiation, left over from end of the Big Bang, when the cosmos was about 380,000 years old.

According to theory, the onset of inflation, less than a trillionth of a second after time began, should have left ripples in space-time known as gravitational waves. They would manifest as corkscrew patterns in the direction of polarization of the cosmic microwaves.

The BICEP group — its name is an acronym for Background Imaging of Cosmic Extragalactic Polarization — is led by Kovac; Jamie Bock of Caltech; Clement Pryke of the University of Minnesota; and Chao-Lin Kuo of Stanford. They have deployed a series of radio telescopes at the South Pole in search of the swirl pattern.

Their most recent, BICEP2, detected a signal in the sweet spot for some of the most popular models of inflation, leading to a splashy news conference and a summer of controversy and gossip.

As the critics pointed out, things besides quantum ripples from the beginning of time could produce those swirls, including light from interstellar dust polarized by magnetic fields in space.

Planck, launched in 2008 to survey the cosmic microwave sky, can distinguish the characteristic signature of dust by comparing the sky brightness in several radio frequencies, as well as measuring its direction of polarization. BICEP2, in contrast, looked at only one frequency, 150 gigahertz.

The BICEP astronomers asked

for Planck data on their patch of sky, but it was not available until now because of suspected instrument problems, Aumont said. So they extrapolated from existing data to conclude that there was little dust interfering with their observations. The new Planck report has knocked the pins out from under that. But there are still large uncertainties that leave room for primordial gravitational waves at some level. For example, the Planck team had to extrapolate some of its own measurements.

As the Planck report says, “This result emphasizes the need for a dedicated joint Planck-BICEP2 analysis.”

The group hopes this analysis will include data from the latest BICEP telescope, called the Keck Array, which has been gathering data for several months.

In an interview this summer, as he waited for the long-overdue Planck dust map to come in, Kovac said, "It's been a funny year to be in the spotlight like this."

He said the group stood behind its work, even if the ultimate interpretation of the measurements is up for grabs.

Acknowledging that dust would not be as sexy a discovery as ripples from inflation, Kovac said, "It's really important as an experimentalist that you can divorce yourself from an investment in what the answer is."

He went on: "One thing that would distress me bitterly is if a major mistake in the measurement or of the analysis would come to light. The most pressing question is, what are the dust contributions to the signal?"

Stay tuned.

Lyman Page, an astrophysicist, at Princeton, said the episode illustrated the messy progress of science.

"Taking a step back," he said by email, "it is amazing that a precise measurement of the cosmos can be made, discussed in fullness, and refuted by another measurement in such a short amount of time. It is testament to a healthy field."

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First public commemoration in Turkey of the Armenian Genocide, organized by the Human Rights Association of Istanbul on April 24, 2010 at the Haydarpasha train station, the location from which in 1915 Armenian intellectuals were deported to the interior and killed.

‘All doors open’ time
Monday following
death of undergrad
*Time for reflection encouraged in
wake of most recent student death*

Phoebe Wang, from Page 1

ulty” asking what they could do to contribute.

Barnhart, along with Undergraduate Association President Shruti Sharma ’15 and Graduate Student Council President John K. Nowocin G, will announce the “all doors open” period to take place this coming Monday at 12 p.m.

“The idea is we’re asking everyone to open your doors, to really gather together, engage with others, and maybe if that’s not what you want to do, just take the time to focus on private reflection,” said Chancellor Barnhart.

Barnhart and student leaders view this time primarily as a symbolic statement. “This is our way of saying the community does care and we want to be there for each other and provide support to each other,” she said.

Sharma added, “[I] think when we have a community doing this together, it only fortifies the message that we are a community... This is all for students.” Nowocin pointed out that students deal with death in different ways and said the “all open doors” period is a product of brainstorming among the student leaders and Barnhart.

In addition to the “all open doors” effort, Barnhart, Chair of the Faculty Steven R. Hall ScD ’85, Sharma, and Nowocin plan to an-

nounce the creation of a mailing address, *we-are@mit.edu*, for MIT community members to share insights from the reflection. The emails will be reviewed by both Hall and Barnhart.

Barnhart hopes that this system will provide her with ideas and identify people who are interested in helping out. “It’s really important that the students are part of the solution,” stated Barnhart.

When asked whether she would use the results of Chancellor W. Eric Grimson’s PhD ’80 2011 review of MIT’s student support systems, Barnhart said that some ideas that were not yet implemented could be part of a longer process.

In their letter to the MIT community, Barnhart, Hall, Sharma, and Nowocin, write: “This pause for shared reflection is merely a beginning... we believe it is an important place to start a significant, long-term conversation for our community.”

“In recent months we have lost too many of our cherished students and dear friends,” Reif said in his letter this past Tuesday. Since March, Reif has emailed the MIT community with news of the deaths of four graduate students and Professor Seth Teller. Three of deaths have been ruled suicides. The cause of death of Austin Travis is still pending, according to the Middlesex district attorney’s office.

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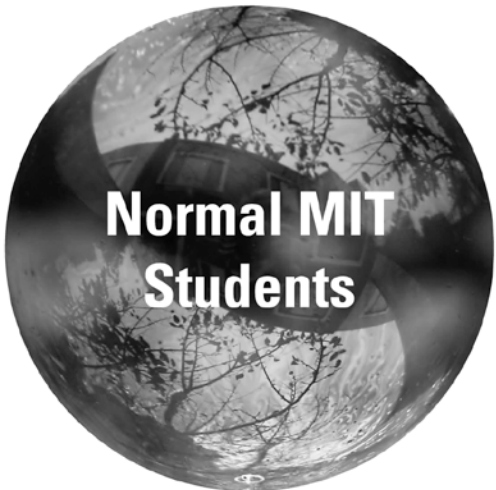
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